The effect of globalization on union bargaining and price-cost margins of firms

Abraham, Filip; Konings, Jozef; Vanormelingen, Stijn

Postprint / Postprint
Zeitschriftenartikel / journal article

Rev World Econ (2009) 145:13–36
DOI 10.1007/s10290-009-0003-8

ORIGINAL PAPER

The effect of globalization on union bargaining and price-cost margins of firms

Filip Abraham · Jozef Konings · Stijn Vanormelingen

Published online: 18 March 2009

Abstract In recent years, Europe has witnessed an accelerated process of economic integration. This paper analyzes how increased economic integration has affected labor and product markets. We use a panel of Belgian manufacturing firms to estimate price-cost margins and union bargaining power and show how various measures of globalization affect them. Import competition puts pressure on both markups and union bargaining power, especially when there is increased competition from low wage countries. This suggests that increased globalization is associated with a moderation of wage claims in unionized countries, which should be associated with positive effects on employment.

Keywords Markups · Trade unions · International trade

JEL Classification F16 · J50 · L13

1 Introduction

In recent years, Europe has witnessed an accelerated process of economic integration: Within the European Union (EU) market barriers were removed, the

F. Abraham
Faculty of Business and Economics, University of Leuven (KUL),
Naamsestraat 69, 3000 Leuven, Belgium
e-mail: Filip.abraham@econ.kuleuven.be

J. Konings (✉)
Faculty of Business and Economics and LICOS, University of Leuven (KUL) and CEPR,
London, UK
e-mail: joep.konings@econ.kuleuven.be

S. Vanormelingen
HU Brussel and LICOS, University of Leuven (KUL), Stormstraat 2, 1000 Brussel, Belgium
e-mail: Stijn.vanormelingen@econ.kuleuven.be

euro was introduced in twelve member states and ten new member states joined the EU in 2004. On a global level, the EU is confronted with the rapid development of several Asian countries, the membership of China in the World Trade Organization (WTO) and the emergence of China and India as new world powers. This trend towards market integration and globalization opens up European economies to international trade and foreign competition. According to Eurostat figures total trade in the EU as a percentage of GDP has gone up substantially compared to 1992 and especially so between the EU and the rest of the world. At the same time, the regional pattern of trade has been shifting. In 1992 only 4% of total extra-EU imports came from China. By 2003 the Chinese market share had increased to 10%. Likewise, the share of the new member states of Central and Eastern Europe (CEEC) in extra EU-15 imports attained 16% in 2003. Such figures imply that trade flows from low wage regions have gained substantial ground in a relatively short period of time.

In recent years, many papers have been written on the role globalization has had on wage and employment outcomes. Most papers, however, find only limited effects of international trade on wages but larger effects on employment, especially for European labor markets. This is most likely due to the more rigid nature of wages and wage setting institutions in Europe.[1] This wage setting process typically depends on factors such as the monetary policy regime, the integration of product markets, the existence of collective agreements and the bargaining power of unions and employers. Globalization affects these factors through various channels. As Rodrik (1997) points out, globalization weakens the bargaining position of trade unions as it increases the substitutability of employees. Furthermore, globalization is likely to put downward pressure on price-cost margins, which limits the scope of rent sharing with trade unions. Such interactions between product and labor markets are emphasized in various macro models that show how more competitive pricing in the product market has beneficial effects, such as lower unemployment rates, on labor market outcomes (e.g., Blanchard and Giavazzi 2003).

This paper adds to this literature in various ways. First, we simultaneously estimate price-cost margins and union bargaining power. Most papers study imperfections in product and labor markets separately.[2] However, ignoring labor market imperfections when measuring competitiveness in the product market, leads to product market power being underestimated. We follow a production function approach as in Hall (1988) and extended by Crépon et al. (2007) to estimate price-cost margins and bargaining power. We apply the Olley and Pakes (1996) method to deal with the endogeneity of productivity shocks. Second, we analyze how price setting and bargaining power is affected by globalization, for which we use several measures including import penetration, outsourcing and foreign direct investment. Third, we use Belgium firm level data in our analysis. This has a number of advantages. Belgium is characterized by strong labor unions and rigid product markets. It therefore provides an interesting benchmark to test how international

[1] For a nice overview of these studies see Part II of Directorate-General for Economic and Financial Affairs (2005).

[2] Exceptions are Bughin (1993, 1996), Konings and Walsh (1994), Crépon et al. (2007), Dobbelaere (2004), Dobbelaere and Mairesse (2008) and Boulhol et al. (2007).

integration affects a small regulated economy in the core of the EU. Moreover the firm level data available are unusually rich. Our data set includes all firms between 1996 and 2004 that have to submit by Belgian law full or abbreviated company accounts. In light of the recent insights of Melitz (2003) and others on the role of firm heterogeneity in international trade it seems natural to use micro data to model the effects of international competition. Finally, Belgium is characterized by a substantial increase in its volume of trade. The value of trade in Belgium has increased with almost 70% during the last decade, while the value of output rose only with 40%. As a consequence most manufacturing sectors experienced a rising import penetration between 1997 and 2004.

The paper is organized as follows. In Sect. 2 we develop a stylized theoretical framework that captures the effects of international competition on price-cost margins and labor market outcomes. Sect. 3 introduces the model that we seek to estimate and discusses the estimation strategy. Sect. 4 discusses the results and Sect. 5 concludes the paper.

2 The effects of globalization: theoretical background

To focus ideas it is useful to introduce a standard benchmark model with one production factor labor (Blanchard 2005). The model illustrates how interactions between the product and the labor market matter for understanding equilibrium unemployment. It is built around two crucial equations, the first being a wage-setting relation, the second a price-setting relation.

Turning to the wage equation first, let the nominal wage level depend on the actual price level (P)[3] and on a function that captures the institutional factors that determine wages or

$$W = PF(u, z), \tag{1}$$

where W stands for the nominal wage, u for the unemployment rate and z for all other factors affecting the wage. Typically, the unemployment rate exerts a negative influence on the wage. The intuition is straightforward: a higher unemployment rate weakens the bargaining position of workers and so lowers the wage.

A similar equation can be derived for the price-setting behavior of firms. Consider a firm that produces goods using labor as the only factor of production. If labor productivity is constant, the production function can be written as $Y = L$ and marginal cost of production is equal to W. To keep things simple, we assume that prices are set as a simple markup over the wage or

$$P = \mu W. \tag{2}$$

In Eq. 2 the degree of competition in the product market plays a determining role. In a non-competitive product market, prices are set significantly higher than marginal cost (W in this model) resulting in a large markup μ. In a perfectly

[3] Typically, it depends on the expected price level, but for simplicity we assume that the expected prices are equal to the actual prices. In the Belgian context of wage indexation this is a reasonable assumption.

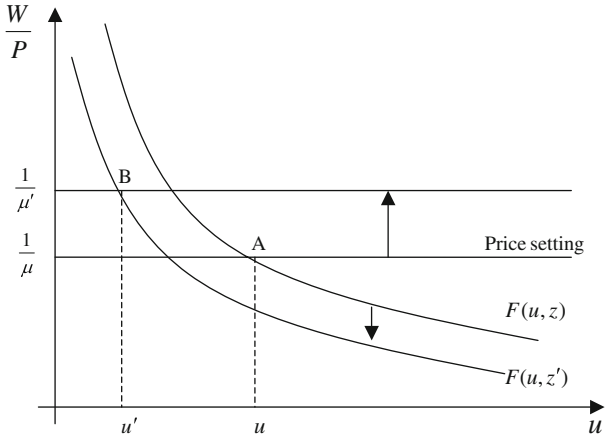

Fig. 1 Interaction between labor market and product market

competitive market, $\mu = 1$ and prices are fully determined by the wage (hence the real wage W/P reaches a maximum value equal to 1).

Figure 1 shows the equilibrium point A in this simple economy, where the price-setting relation is equal to the wage-setting relation. Through its impact on the markup μ, the degree of competition in the product market has an impact on the equilibrium unemployment rate. Hence, characteristics of the product market affect the equilibrium outcome in the labor market.

How does economic integration in the product market affect the labor market in this simple framework? A variety of theoretical models show that economic integration causes μ to fall, e.g., when integration makes more product varieties available (Krugman 1979; cf. Chen et al. (2009) for a recent application) In Fig. 1 international competition therefore shifts the price-setting equation upwards: for given wage levels, prices are lower and hence real wage costs for firms rise to a level closer to the competitive benchmark. As a consequence, profit rates for individual companies decline. In addition, international economic integration changes the wage-setting relationship. For a given unemployment rate, lower profit rates translate in smaller rents that can be redistributed to union members. If globalization moreover implies that multinational enterprises can shift employment across affiliates more easily,[4] then the bargaining power of workers will decline. All of this will force union members to accept wage moderation, shifting the wage setting curve down. The new equilibrium is found in B. Compared to the initial equilibrium in A, equilibrium unemployment has gone down, prices and nominal wages are lower and the markup μ' of prices over wage costs has been reduced.

The bottom-line from this analysis is that interactions between product and labor markets matter for understanding equilibrium unemployment of an economy. It is also clear though that the effects of international competition depend very much on

[4] Recent evidence confirms that multinational enterprises do relocate employment across affiliates, for the United States see Brainard and Riker (1997) and Hanson et al. (2005), for Europe see Braconier and Ekholm (2000) and Konings and Murphy (2006).

the slopes and the responsiveness of the wage and price-setting relations in the economy, which is ultimately an empirical question. This is what we take up in the rest of the paper.

3 Empirical model and methodology

In the previous section we presented a model to illustrate that imperfections in product and input markets are interlinked. To get an idea of these imperfections and assess the impact of globalization on them, a more structural model is needed. We rely on the work of Hall (1988) who showed that the Solow residual, used to measure productivity growth, should be corrected for imperfect competition in the product market. It thereby offers a method to estimate the price-cost margin without observing prices and marginal costs directly. Starting from a production function where output Q_{it} of firm i in year t is produced from three inputs, namely labor L_{it}, capital K_{it} and materials M_{it}:

$$Q_{it} = A_{it}F(L_{it}, K_{it}, M_{it}), \tag{3}$$

where A_{it} captures Hicks neutral technological progress. The function $F(.)$ is homogeneous of degree $1 + \lambda$ for all input factors, i.e., the returns to scale are $1 + \lambda$. $F(.)$ can exhibit decreasing ($\lambda < 0$), constant ($\lambda < 0$) or increasing ($\lambda < 0$) returns to scale. Expressing Eq. 3 in growth rates:

$$\Delta q_{it} = \varepsilon_{it}^{L}\Delta(l_{it}) + \varepsilon_{it}^{M}\Delta(m_{it}) + \varepsilon_{it}^{K}\Delta k_{it} + \Delta a_{it}. \tag{4}$$

The variables q_{it}, l_{it}, m_{it}, k_{it} and a_{it} are the natural logarithms of Q_{it}, L_{it}, M_{it}, K_{it} and A_{it} respectively. ε_{it}^{X} is the elasticity of output with respect to input X, namely $\varepsilon_{it}^{X} = \frac{\partial Q_{it}}{\partial X_{it}}\frac{X_{it}}{Q_{it}}$. The first-order conditions for a profit maximizing firm imply that $\varepsilon_{it}^{X} = \mu_{it}\alpha_{X,it}$, where $\mu_{it} = P_{it}/MC_{it}$ or the markup at the output market and $\alpha_{X,it}$ is the cost share in total revenue of input X, i.e., $\frac{P_{it}^{X}X_{it}}{P_{it}Q_{it}}$ (X = L, M, K). The cost share in total revenue of input X underestimates the input elasticity if markets are not perfectly competitive ($\mu_{it} > 1$). Replacing input elasticities with their adjusted factor shares gives the following expression:

$$\Delta(q_{it} - k_{it}) = \mu_{it}\big(\alpha_{L,it}\Delta(l_{it} - k_{it}) + \alpha_{M,it}\Delta(m_{it} - k_{it})\big) + \lambda_{it}\Delta k_{it} + \Delta a_{it}. \tag{5}$$

Here we use the fact that returns to scale are $(1 + \lambda_{it}) = \varepsilon_{it}^{K} + \varepsilon_{it}^{L} + \varepsilon_{it}^{M}$ and as such elasticity of output with respect to capital can be expressed as $\varepsilon_{it}^{K} = (1 + \lambda_{it}) - \mu_{it}\alpha_{L,it} - \mu_{it}\alpha_{M,it}$. This avoids the problematic computation of the user cost of capital in our empirical analysis. Equation 5 can also be written as

$$SR_{it} = \beta_{it}LER_{it} + \frac{\lambda_{it}}{\mu_{it}}\Delta k_{it} + (1 - \beta_{it})\Delta a_{it}, \tag{6}$$

where β_{it} is the Lerner index ($\beta_{it} = (P_{it} - MC_{it})/P_{it} = 1 - (1/\mu_{it})$) $SR_{it} \equiv \Delta(q_{it} - k_{it}) - (\alpha_{L,it}\Delta(l_{it} - k_{it}) + \alpha_{M,it}\Delta(m_{it} - k_{it}))$, the classic Solow residual and $LER_{it} \equiv \Delta(q_{it} - k_{it})$. From this equation the Lerner index and returns to scale can be estimated. Note that by the use of first differences, any firm-specific fixed

effect from the level equation is eliminated. This framework has been used to estimate the impact of trade liberalization on market power of firms in a number of papers, starting with Levinsohn (1993) for Turkey and Harrison (1994) for Côte-d'-Ivoir and more recently by Konings et al. (2001, 2005) for a number of industrialized and emerging economies.

As pointed out by Crépon et al. (2007), one potential problem of this framework is that it assumes competitive labor markets. However, most European countries are characterized by labor markets where negotiations between unions and firms take place. We therefore follow Crépon et al. (2007) to incorporate a model of efficient bargaining in the above framework. In this model unions and firms bargain over both wages and employment.[5] Unions are assumed to be utilitarian and their objective is to maximize the amount of rent sharing $L_{it}(w_{it} - w_{a,it})$ with $w_{a,it}$ the reservation wage.[6] The firm objective is to maximize its short run profits $P_{it}Q_{it} - w_{it}L_{it}$. Note that for now we assume there is no other variable input factor than labor, so we assume the materials and capital input to be fixed at the point of the bargaining, which is consistent with a firm making investment and material purchases decisions before the bargaining takes place. This does not affect the bargaining outcome as long as the union preferences do not depend on these inputs (Bughin 1993, 1996).[7] Whether materials or capital are assumed to be fixed or flexible, the amount of both inputs will be chosen such that their marginal revenue product equals their price. The solution to the bargaining problem is given by maximization of the generalized Nash bargain:

$$\max_{w,L} \Omega = \left(L_{it}\left(w_{it} - w_{a,it}\right)\right)^{\Phi_{it}} \left(P_{it}Q_{it} - w_{it}L_{it}\right)^{1-\Phi_{it}}, \tag{7}$$

where Φ is the union bargaining power; $0 \leq \Phi \leq 1$. Derivation of the bargaining equation with respect to wage and employment gives the following first-order conditions:

$$w_{it} = (1 - \Phi_{it})w_{a,it} + \Phi_{it}\frac{P_{it}Q_{it}}{L_{it}}, \tag{8}$$

$$w_{it} = \frac{\Phi_{it}}{1 - \Phi_{it}}\left(\frac{P_{it}Q_{it} - w_{it}L_{it}}{L_{it}}\right) + R_{L,it} \quad \text{with } R_{L,it} = \frac{\partial(P_{it}Q_{it})}{\partial L_{it}}. \tag{9}$$

[5] It is rarely observed in reality that union and firm bargain over the absolute level of employment (Booth 1995). However, negotiations over work practices and crew size are common practice which influences the labor-capital ratio. When capital is fixed at the moment of the bargain, bargaining over *L*/*K* is the same as bargaining over the absolute level of employment. Moreover, even if capital is a variable input, bargaining over crew size will also lead to an outcome on a contract curve to the right of the labor demand curve (Clark 1990).

[6] For ease of notation we assume workers are risk-neutral. The outcome is exactly the same when this assumption is relaxed (cf. Boulhol et al. 2007).

[7] We also experimented with a different specification such that the profit of the firm that is bargained over equals ($PQ-zM-wL$) like in Dobbelaere and Mairesse (2008), with z the price of materials. Under these assumptions (10) becomes. $\varepsilon_L = \mu\alpha_L + \mu\frac{\Phi'}{1-\Phi'}(\alpha_L + \alpha_M - 1)$ and we expect to find empirically a higher union bargaining power because the rents that are bargained over are now net of both labor and material expenses. The same reasoning can be applied when capital is assumed to be a variable input factor.

Solving these two expressions simultaneously gives an expression for the contract curve, $R_{L,it} = w_{a,it}$. Using $R_{L,it} = \frac{\partial(P_{it}Q_{it})}{\partial Q_{it}} \frac{\partial Q_{it}}{\partial L_{it}} = \frac{P_{it}}{\mu_{it}} \frac{\partial Q_{it}}{\partial L_{it}}$ together with Eq. 8 and the expression for the contract curve, one can find that

$$\varepsilon_{L,it} = \mu_{it}\alpha_{L,it} + \mu_{it}\frac{\Phi_{it}}{1-\Phi_{it}}\left(\alpha_{L,it} - 1\right). \tag{10}$$

Note that the right-to-manage bargaining model, where the union and the firm bargain over wages and the firm is free to set the level of labor, results in a point $\left(w_{it}^{RTM}, L_{it}^{RTM}\right)$ on the labor demand curve. Consequently, the elasticity of output with respect to labor would be equal to the labor cost share in total revenue adjusted for the markup, i.e., $\varepsilon_{L,it} = \mu_{it}\alpha_{L,it}$ and Eq. 6 would not change such that the bargaining power would be estimated to be equal to zero.

Combining Eqs. 4 and 10, an extra term which captures the union bargaining power appears in Eq. 6 or

$$SR_{it} = \beta_{it}LER_{it} + \frac{\lambda_{it}}{\mu_{it}}\Delta k_{it} + \frac{\Phi_{it}}{1-\Phi_{it}}BAR_{it} + (1-\beta_{it})\Delta a_{it},, \tag{11}$$

with $BAR_{it} \equiv (\alpha_{L,it} - 1)\Delta(l_{it} - k_{it})$. This will be our basic equation used in the further analysis and allows us to estimate price-cost margins and bargaining power simultaneously without having to make assumptions about the alternative wage rate. Crépon et al. (2007) show that in this setting the price-cost markup must be interpreted as the ratio of price over cost evaluated at the alternative wage instead of the bargained wage. This follows from the fact that in the efficient bargaining framework marginal revenue of labor equals the alternative wage. As a result, the firm makes input and output decisions as if it was maximizing profit computed at the alternative wage.

A potential problem with estimating Eq. 11 is the endogeneity of the unobserved productivity shock, Δa_{it}. Since l_{it} is a variable input, it depends on the productivity a_{it} in the same period. As a result Δl_{it} is correlated with Δa_{it} and OLS estimates of the bargaining term are likely to be biased. Similarly, Δq_{it} will be correlated with Δa_{it} because higher productivity will lead to higher output.

One solution is to use an instrumental variables approach. Unfortunately, it is often difficult to come up with appropriate instruments. Our alternative approach is based on recent findings of the productivity literature, more specifically on the methodology to estimate production functions developed by Olley and Pakes (1996). We follow Hoekman and Kee (2007) and De Loecker and Warzynski (2009), who have applied this methodology to estimate price-cost margins. This approach proxies the unobservable productivity shock by a polynomial in capital and investment, both in present and lagged values. The methodology yields consistent estimates for the Lerner index and for union bargaining power. However, it does not allow a separate identification of the returns to scale parameter because the productivity shock is proxied by a polynomial in capital and investment which also absorbs the returns to scale parameter. This is not a major problem since our main interest lies in identifying the price-cost margins and union bargaining power. The drawback of applying the Olley and Pakes correction is that only observations with positive investment can be used, which reduces our sample size considerably.

4 Data and results

4.1 Data

Firm data are taken from the Belfirst database. The database includes the full company accounts of every Belgian firm that has to report to the tax authorities. For our analysis we selected the whole manufacturing sector (NACE code 15 to 36) with the exception of the recycling sector. We retrieved data for the period 1996–2004. The variables used for the analysis are turnover, tangible fixed assets, number of employees (in full time equivalents), wage bill and material costs (raw materials, consumables and services). Turnover is deflated with a Producer Price Index (PPI) at the 3-digit NACE level provided by Eurostat. If this PPI was not available for the sector, a 2-digit NACE deflator was used. Tangible fixed assets are deflated using a countrywide investment deflator and material costs are deflated with a NACE 2-digit intermediate goods deflator, constructed from input–output tables. The database provides also information about the ownership structure, so we are able to determine whether a firm has a foreign owner. However we only observe ownership in 2004. Imports by country of origin, are made available by the National Bank of Belgium also at the 4-digit NACE level.

In order for a firm to be added to the sample, we required at least three consecutive observations in our sample. In addition, we dropped observations which seemed to be obvious data input mistakes (such as firms with negative wage costs), observations for which the growth rates in inputs and output were unrealistically high and firms which reported labor costs to be higher than gross value added. Our final sample consists of an unbalanced panel of 6,125 firms and in total 35,222 observations. In Table 1 we report summary statistics. The median firm has 17 employees, earns a revenue of 3.05 million euros and faces a labor cost of 34,100 euros per employee per year. The labor cost share in total turnover is about 22% in the average manufacturing firm.

4.2 Estimation results for the markup and bargaining power

We start by estimating Eqs. 6 and 11 to first obtain an estimate of the average markup for the manufacturing industry as a whole with and without controlling for

Table 1 Summary statistics of the sample of Belgian firms

Variable	Mean	Median	SD
Turnover (1,000 euro)	24,495	3,048	156,195
Employment	78	17	305
Material costs (1,000 euro)	18,578	1,917	131,661
Tangible fixed assets	4,062	472	25,819
Labor cost per worker (1,000 euro)	35.6	34.1	17.7
Labor cost share in turnover	0.22	0.20	0.13
Material costs share in turnover	0.66	0.67	0.16

the bargaining power of the union. Table 2 reports the results for the markup and bargaining power in the combined sample of all manufacturing companies.[8] In column (1) we report a simple OLS estimate of Eq. 6. Column (2) and (3) show OLS and fixed effects estimates of Eq. 11 respectively where we control for the bargaining power of firms. In column (4) we adopt the Olley–Pakes methodology to Eq. 11 and include a fourth-order polynomial of both present and lagged capital and investment to correct for potential endogeneity of the righthand-side variables. Column (5) shows OLS results for the subsample used to apply the Olley–Pakes correction. Finally, in column (6) results are reported of the specification where the rents unions and firms bargain over take material costs into account. All equations are estimated with year and industry dummies, capturing time and industry specific shocks.[9]

From column (1), it can be seen that the average price over marginal cost ratio in Belgian manufacturing is around 1.29. This increases in column (2) to 1.35 when we take into account that unions bargain over wages and employment with employers. The Olley–Pakes correction in the last column does not affect our results all that much when we compare the coefficients with those obtained by performing normal OLS on the same subsample.[10] This is in accordance with Harrison (1994) and Boulhol et al. (2007) who report very close results when comparing their fixed effects and IV estimates. The fact that the average markup is smaller when the bargaining power of firms is not taken into account is expected as the bargaining power term is negatively correlated with the markup term. As can be seen from the last column, the estimated union bargaining power is higher when the rents that are bargained over, are net of material costs. This is in line with our expectations as discussed in the previous section. The estimates of the average markup are in agreement with earlier work by Konings et al. (2001) who report for Belgium an average markup of 1.28 without controlling for imperfections in the labor market. These findings are also consistent with the results found by Dobbelaere (2004) and Crépon et al. (2007), who estimate an average markup and bargaining power for Belgium and France of 1.49 and 1.42 respectively.

How important are sectoral differences in markups and levels of bargaining power? To address this question, we estimated Eq. 11 for each 2-digit NACE sector separately.[11] The estimated sectoral markups[12] are reported in Fig. 2. The markup

[8] All tables report heteroskedasticity-robust standard errors clustered at the firm level. The adjusted R^2 is reported for all regressions. In specifications with firm fixed effects, the within R^2 is shown.

[9] The estimations were also done with interactions between time and industry dummies. This did not change the results.

[10] Note that the estimation equation is already in first differences such that part of the possible simultaneity bias has already been accounted for in the OLS estimations.

[11] Tobacco products (NACE 16), Leather (NACE 19), Coke, refined petroleum and nuclear fuel (NACE 23), Office machinery and computers (NACE 30), Audio, TV and Telecommunication apparatus (NACE 32) and other transport equipment (NACE 35) are excluded due to too few observations for reliable estimates.

[12] We computed the accounting Lerner index as $\frac{PQ-wL-zM}{PQ}$ and compared the results with the estimated Lerner index. The correlation coefficient between the two measures equals 0.72.

Table 2 Markup and bargaining for manufacturing as a whole

	(1) OLS1	(2) OLS2	(3) FE	(4) OP1	(5) OLS3	(6) OP2
Lerner index	0.222 (0.004)***	0.259 (0.005)***	0.266 (0.004)***	0.250 (0.006)***	0.249 (0.006)***	0.240 (0.005)***
Δk	0.102 (0.004)***	0.044 (0.004)***	0.044 (0.005)***			
Bargaining term		0.132 (0.004)***	0.136 (0.004)***	0.137 (0.005)***	0.138 (0.005)***	0.584 (0.035)***
Markup	1.29	1.35	1.36	1.33	1.33	1.32
Returns to scale	1.13	1.09	1.06			
Bargaining power		0.117	0.119	0.120	0.121	0.369
Observations	30,398	30,398	30,398	16,985	16,985	16,985
Adj. R^2	0.308	0.391	0.396	0.352	0.350	0.310
No. of firms	6,125	6,125	6,125	4,704	4,704	4,704

Robust standard errors in parentheses

*, **, *** denote significance at the level of 10, 5, and 1% respectively

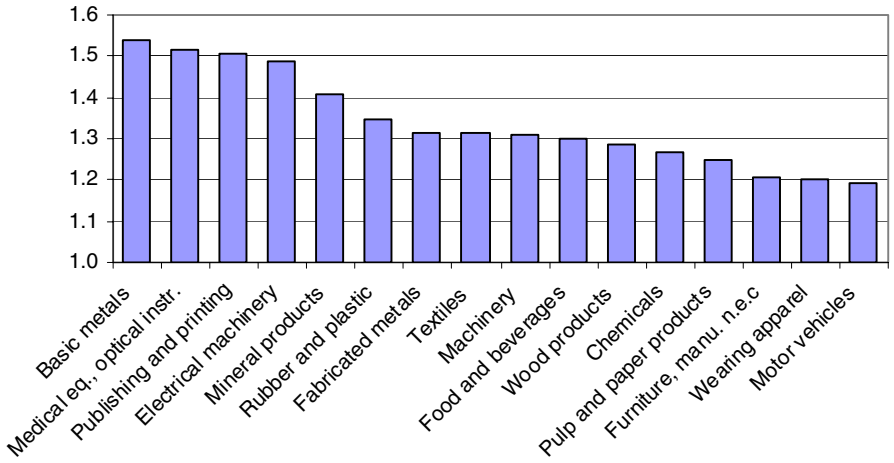

Fig. 2 Markup per NACE 2-digit sector

ranges from 1.19 to 1.54. It is not surprising to find Pulp and Paper Products, Furniture and Manufacturing n.e.c. and Wearing Apparel among the low markup sectors since these are all low technology sectors. A similar reasoning can be applied to explain high markups in Medical, Precision and Optical Instruments and Electrical Machinery. These are both high technology sectors with substantial research and development (R&D) expenditures. Typically such sectors need higher markups to recoup the sunk R&D investment (Konings et al. 2001). Another sector with a relatively high markup is Publishing and Printing which is characterized by a low amount of international trade. More generally, relating the Lerner index estimates with a measure of foreign competition, namely import penetration, results in a correlation of -0.30. When we split up import penetration by country of origin, only imports from low-wage countries are relatively strong correlated with the markup estimates, namely the correlation coefficient equals -0.40. This issue will be further investigated in the next sections. Figure 3 shows the bargaining power per 2-digit NACE sector. In order to check whether these estimates are sensible we compared them with a wage over labor productivity ratio. We expect this ratio to be higher in sectors characterized by higher union bargaining power. The correlation between the two is indeed positive and equal to 0.48.

Comparing Figs. 2 and 3, we observe that sectors with higher markups are often sectors with stronger union bargaining power. For instance, the sector of Electrical Machinery has the highest bargaining power, which coincides with high markups. At the other end of the range, for example the Furniture sector is characterized by both a low bargaining power and markup. The statistically significant correlation coefficient between the two parameters equals 0.56.[13] Those results suggest that

[13] The same exercise was done using different depreciation levels to compute investment to correct for the unobservable productivity growth using Olley–Pakes. We also experimented with a system GMM estimator as in Blundell and Bond (1998), using lagged employment and output as instruments. The results did not change.

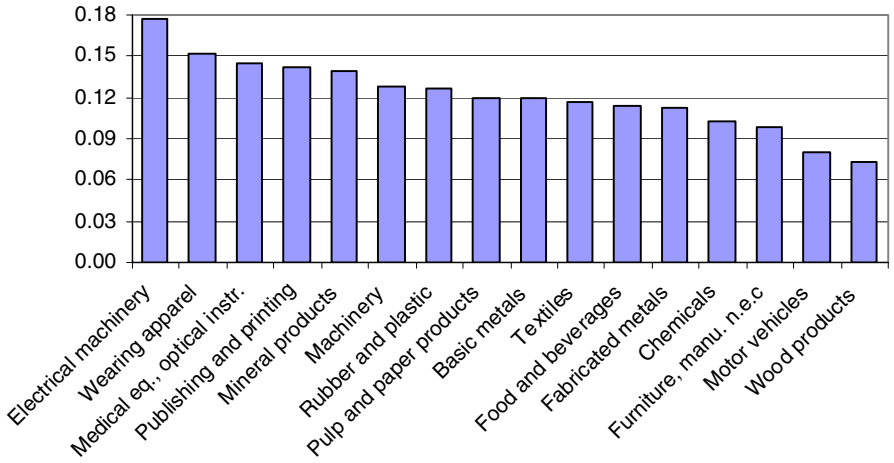

Fig. 3 Bargaining power per NACE 2-digit sector

unions are able to negotiate successful deals in sectors with substantial economic rents but find limited room for wage gains in competitive sectors where the average markup is low.[14]

The Marshall rules of derived demand may provide some insights for the interpretation of the observed patterns. The second law states that the demand for labor will be more elastic, the greater the own-price elasticity of demand for the output it produces. It is clear that the Lerner index equals the inverse of the own-price elasticity, i.e., a lower Lerner index coincides with a more elastic demand. In view of this fact, it is not surprising that unions tend to organize themselves in sectors with higher price-cost margins since labor demand is less elastic in these sectors. As a result, higher wage claims will not lead to large employment cutbacks.

4.3 The impact of globalization

In this section we turn to the impact of globalization on markups and union bargaining power. Therefore, we include interactions between globalization variables and the regressors shown in Eqs. 6 and 11. The estimated coefficients for these interactions can be interpreted as marginal effects of the variables on markups and bargaining power. We opt for this strategy because it allows us to directly measure the impact of international competition on the parameters of interest without having to estimate them directly at the industry/year level. Moreover, we are able to use the variables that capture international

[14] This is consistent with for example Stewart (1990) who finds significant union-non-union wage differentials in firms with market power, but no wage differentials in firms operating in a highly competitive environment. However, note that the lack of a union wage differential in the competitive sector can also be due to the absence of economic rents besides differences in union bargaining power.

competition at the most disaggregated level,[15] i.e., we use import penetration at the 4-digit NACE level, where import penetration in sector j is defined as $\frac{imports_{jt}}{imports_{jt}+production_{jt}}$.

In Table 3 results of this exercise are shown. Columns (1)–(3) report OLS estimates, column (4) repeats the specification of column (3) but with firm fixed effects included and columns (5)–(7) report the same specifications but with the Olley–Pakes correction. We start by augmenting Eq. 11 with import penetration and interactions of import penetration with the right-hand-side variables in Eq. 11, to test whether international competition is associated with lower markups and lower union bargaining power. Whenever the interaction between a variable and the Lerner index term or bargaining term is included, the variable itself also enters the equation.

As discussed in Sect. 2, we expect that import competition lowers markups as more import competition disciplines firm price setting behavior. Moreover there are reasons to believe that import competition lowers union bargaining power. Binmore et al. (1986) show how bargaining power can be determined by the perceived risk of both parties that bargaining will break down. So, if unions think globalization increases the risk of firms leaving the bargaining table, their bargaining power will drop. In the same line of reasoning, Dumont et al. (2006) claim that bargaining power can be considered as a measure of the credibility of the respective outside options. As globalization increases the credibility of the firm leaving the bargaining round, sectors with higher import penetration should be associated with lower bargaining power.

From Table 3 we note that import penetration has indeed a negative and significant effect on the markup and on the bargaining power of unions.[16] In particular, from column (7) it can be noted that a hypothetical autarkic sector would have a Lerner index of 0.258. A sector evaluated at the average import penetration rate (50%) has only a Lerner index of 0.234. This means that a sector facing the average amount of foreign competition has a 10% lower price-cost margin than a sector facing no import competition. Similar, unions are able to capture 13% of the rents in sectors with no import competition while they only

[15] It would be practically infeasible to apply some kind of two-step approach where in a first step mark-ups and bargaining power are estimated for each industry/year combination and in a second step these estimates are related to globalization variables. This because of the limited amount of firms in each 4-digit NACE industry.

[16] Belgium is characterized by a large amount of importing/re-exporting activities about which there is no detailed data available to our knowledge. However, the interpretation of our results holds as long as sectors characterized by large importing/re-exporting activities do not have lower mark-ups and union bargaining power because of reasons other than international trade. The importing/re-exporting introduces measurement error in our import penetration variable and as a result our estimated coefficient for the impact of international trade is biased towards zero. However, the coefficient remains significantly negative, so our estimate of the impact of import penetration can in a way be interpreted as a conservative measure of the real impact of import penetration.

Table 3 Determinants bargaining power and markup

	(1) OLS1	(2) OLS2	(3) OLS3	(4) FE	(5) OP1	(6) OP2	(7) OP3
Lerner index	0.226 (0.006)***	0.280 (0.007)***	0.279 (0.008)***	0.282 (0.009)***	0.215 (0.012)***	0.263 (0.013)***	0.258 (0.013)***
Δk	0.103 (0.005)***	0.045 (0.005)***	0.045 (0.005)***	0.045 (0.006)***			
Bargaining		0.154 (0.007)***	0.158 (0.007)***	0.160 (0.008)***		0.148 (0.009)***	0.146 (0.010)***
Import penetration × Lerner	−0.017 (0.008)**	−0.058 (0.013)***	−0.060 (0.014)***	−0.057 (0.015)***	−0.022 (0.025)	−0.043 (0.026)*	−0.047 (0.025)*
Import penetration × bargaining		−0.058 (0.014)***	−0.058 (0.015)***	−0.055 (0.015)***		−0.032 (0.020)	−0.034 (0.020)*
LARGE × Lerner			0.003 (0.009)	0.009 (0.010)			0.008 (0.017)
LARGE × bargaining			0.010 (0.011)	0.010 (0.012)			0.013 (0.014)
FOREIGN × Lerner			0.015 (0.015)	0.018 (0.015)			0.034 (0.022)
FOREIGN × bargaining			0.003 (0.017)	0.003 (0.018)			0.017 (0.018)
For employment share × bargaining			−0.023 (0.011)**	−0.021 (0.012)*			−0.008 (0.019)
Import penetration	0.012 (0.002)***	0.012 (0.002)***	0.012 (0.002)***	0.010 (0.014)	0.007 (0.003)**	0.007 (0.003)**	0.007 (0.003)**
LARGE dummy			0.002 (0.001)***				0.000 (0.001)
FOREIGN dummy			0.002 (0.001)				0.000 (0.001)
Employment share foreign			−0.005 (0.002)***				−0.005 (0.003)*
Observations	27,337	27,337	27,337	27,337	15,336	15,336	15,336
Adj. R^2	0.392	0.393	0.396	0.392	0.24	0.355	0.356
No. of firms	5,491	5,491	5,491	5,491	4,246	4,246	4,246

Robust standard errors in parentheses

*, **, *** denote significance at the level of 10, 5, and 1% respectively

capture 11% in sectors with average import competition, which means a difference of 15%.[17]

In columns (3) and (6) we add a dummy LARGE which equals one if the firm has more than 50 employees. We interact this dummy with both the bargaining and Lerner term. The interaction with bargaining captures an essential aspect of firm level bargaining in the Belgian economy. Large firms have different legal obligations for union representation than small firms. In large firms it is moreover easier to organize a strike which can put pressure on the negotiations. Hence we expect the estimated union bargaining power to be higher in large firms. Indeed, the coefficient on the interaction between LARGE and the bargaining term is positive, but not statistically significant from zero.

In this same specification we also check whether the share of employment in foreign firms[18] in total sectoral employment matters for the bargaining power. One would expect this interaction to be negative since multinationals may be more footloose than domestic firms and as a result unions fear multinationals will reallocate their production (Van Beveren 2007). The OLS and fixed effects regressions find this to be the case, but this effect becomes insignificant when applying the Olley–Pakes correction. Following the same line of reasoning, union bargaining power in foreign firms is expected to be lower. However the coefficient for the interaction between a foreign ownership dummy and the bargaining term is insignificant. This can be explained by the fact that in Belgium most of the bargaining takes place at the sectoral level.

Finally, the Lerner index was interacted with a foreign owner dummy. Most theoretical and empirical literature shows that foreign firms are more efficient than domestic firms and should therefore, all other things equal, be able to charge a higher markup. The interactions show up to be positive but insignificant.

As noted above, import penetration itself is included in the regression. The coefficient is positive and highly significant. Under the classical interpretation of the left hand side variable in Eq. 11 as the Solow residual, this points to a positive impact of international competition on productivity growth.

4.4 Origin of imports

The above results show that sectors with high import penetration rates tend to have lower markups and union bargaining power. Now, we distinguish the import penetration between different countries of origin. In our data set we observe for each 4-digit NACE sector the amount of imports coming from each country. We classify

[17] The inclusion of import penetration on itself interacted with the Lerner and bargaining term, implies that the marginal impact of an increase in import penetration is the same for a sector with high import penetration rates as for sectors with low import penetration rate. To control for this, we also included import penetration squared next to import penetration and interacted it with the right-hand-side variables. As expected, the coefficient for the interaction between import penetration and the right-hand-side variables was negative and the coefficient at the interaction with import penetration squared was positive. This points towards smaller marginal effects of import penetration on mark-ups and bargaining for higher import penetration rates. .

[18] A foreign firm is a firm which has any foreign owner in 2004.

all countries in four groups, namely imports from other EU-15 countries, imports from the 10 new EU members, imports from OECD countries other than EU-25 and countries other than EU-25 and OECD. The last category can be seen as a low-wage countries group. Import penetration from country group k in sector j is now defined as [19] $IP_{jk} = \frac{imports_{jk}}{total\_imports_j + production_j}$ such that $IP_j = \sum_{k=1}^{4} IP_{jk}$.

Over the past 10 years, especially imports from low-wage countries and the new EU accession countries have increased. However, the bulk of imports still come from other EU-15 countries. In 2004, almost 75% of Belgian imports came from other EU-15 countries, while the new accession countries and low-wage countries accounted for 2.4 and 12.1% respectively. The share of imports from OECD countries other than EU-25 was 13.4%. We use imports by country of origin to estimate whether markups are correlated differently with import penetration from different countries. Results are shown in Table 4. The only interaction that is strongly significant in all specifications is the one with imports from low wage countries. Also the interaction between the bargaining term and import penetration from new EU countries is significant in some specifications. Since both imports from low-wage countries and EU accession countries show a clear upward trend, we ran the regressions with year dummies interacted with the Lerner index and bargaining power next to interactions with the import penetration variables. By doing this exercise, interactions with import penetration from new EU countries become insignificant as reported in the following section. The results for import penetration from low-wage countries do not change.

Table 4 shows how competition from low wage countries tends to lower markups and union bargaining power in Belgian manufacturing, and this for both the pooled OLS results as for the equation with the Olley–Pakes correction. The results imply that a sector facing high import competition from low wage countries (25%) has an average price-cost margin of 0.197 while a sector characterized by no import competition from low wage countries shows on average a Lerner index of 0.254. Union bargaining power equals 0.13 and 0.10 in sectors with autarky and high import competition from low-wage countries respectively. This is consistent with Bernard et al. (2006) who show that plant survival and growth are negatively associated with imports from low-wage countries. Because of the fear of firms exiting the market, unions will be more reluctant to press for higher wages. Again as a robustness check, we ran the same regression as in column (2) but now with firm fixed effects. Results are reported in column (3) and show that the main conclusions hold also for this specification. Note that import penetration from other EU-15 countries is significantly positive in most specifications. Again, this points to productivity gains of import competition from other EU countries. Imports from other regions have no impact on productivity growth of Belgian manufacturing firms.

4.5 Year and sector heterogeneity

We previously showed that there exists large heterogeneity in markups across different sectors. More exactly, markups range from 1.19 to 1.54 and union

[19] For expositional reasons, time subscripts are omitted.

Table 4 Origin of imports and Lerner index/bargaining power

	(1) OLS1	(2) OLS2	(3) FE	(4) OP1	(5) OP2
Lerner	0.222 (0.006)***	0.272 (0.008)***	0.277 (0.008)***	0.207 (0.012)***	0.254 (0.013)***
Δk	0.104 (0.005)***	0.046 (0.005)**	0.047 (0.006)***		
Bargaining		0.148 (0.007)***	0.150 (0.008)***		0.144 (0.009)***
Imp. pen. intra EU-15 × Lerner	0.027 (0.014)*	0.007 (0.021)	0.009 (0.024)	0.024 (0.038)	0.011 (0.039)
Imp. pen. other × Lerner	−0.144 (0.023)***	−0.249 (0.036)***	−0.237 (0.040)***	−0.202 (0.061)***	−0.228 (0.062)***
Imp. pen. intra EU-15 × bargaining		−0.033 (0.022)	−0.030 (0.024)		−0.021 (0.029)
Imp. pen. OECD × bargaining		−0.011 (0.068)	−0.028 (0.077)		−0.03 (0.103)
Imp. pen. other × bargaining		−0.184 (0.040)***	−0.171 (0.044)***		−0.117 (0.059)**
Imp. pen. new EU × bargaining		0.507 (0.290)*	0.493 (0.310)		0.759 (0.372)**
Import penetration intra EU	0.019 (0.003)***	0.020 (0.003)***	0.024 (0.017)	0.017 (0.004)***	0.017 (0.004)***
Import penetration OECD	−0.007 (0.010)	−0.005 (0.010)	−0.061 (0.040)	−0.027 (0.012)**	−0.028 (0.012)**
Import penetration other	0.002 (0.007)	−0.002 (0.006)	−0.005 (0.031)	−0.008 (0.008)	−0.009 (0.008)
Import penetration new EU	−0.005 (0.027)	−0.007 (0.026)	−0.066 (0.091)	−0.001 (0.033)	0.001 (0.032)
Observations	27,337	27,337	27,337	15,336	15,336
Adj. R^2	0.309	0.398	0.400	0.243	0.359
No. of firms	5,491	5,491	5,491	4,246	4,246

Robust standard errors in parentheses

*, **, *** denote significance at the level of 10, 5, and 1% respectively

Table 5 Impact of import competition allowing for sector-specific Lerner index and union bargaining power

	(1) OLS1	(2) FE	(3) OLS	(4) FE
Import penetration × Lerner	−0.038 (0.018)**	−0.031 (0.020)	−0.035 (0.018)**	−0.026 (0.019)
Import penetration × bargaining	−0.058 (0.019)***	−0.055 (0.021)***	−0.054 (0.019)***	−0.049 (0.020)**
Import penetration	0.011 (0.002)***	0.003 (0.014)	0.011 (0.002)***	0.004 (0.014)
Sector dummies interacted with RHS variables	X	X	X	X
Year dummies interacted with RHS variables			X	X
Observations	27,337	27,337	27,337	27,337
Adj R^2	0.409	0.414	0.395	0.399
No. of firms	5,491	5,491	5,491	5,491

bargaining power is between 0.08 and 0.18. Part of this heterogeneity can be explained by differences in import competition as shown above. However, the impact of globalization is not large enough to explain all differences in average sectoral markups. As a robustness check, we repeated the regressions reported in Tables 3 and 4 but now allowing for sector and year specific markups at the NACE 2-digit level and estimate an average effect of import penetration[20] over all sectors and periods. More specifically we interacted the Lerner term, bargaining term and Δk with sector and year dummies. The estimation equation can be written as follows

$$\begin{aligned} SR_{it} = & \left(\beta_I + \beta_t + \beta_{IMP} Import_{jt}\right) * LER_{it} \\ & + \left(\left(\frac{\Phi}{1-\Phi}\right)_I + \left(\frac{\Phi}{1-\Phi}\right)_t + \left(\frac{\Phi}{1-\Phi}\right)_{IMP} Import_{jt} \right) * BAR_{it} \\ & + \left(\left(\frac{\lambda}{\mu}\right)_I + \left(\frac{\lambda}{\mu}\right)_t \right) \Delta k_{it} + \delta Import_{jt} + \alpha_I + \alpha_t + \varepsilon_{it} \end{aligned}$$

The average Lerner index in period t and subsector j of sector I equals $\beta_{jt} = \beta_I + \beta_t + \beta_{IMP}{}^* Import_{jt}$ with $Import_{jt}$ the import penetration in subsector j. The average union bargaining power can be derived in a similar way. Results are reported in Tables 5 and 6. Column (1) and (2) report respectively the ordinary least squares and fixed effects regression for the specification with sector dummies but without time dummies. The set of sector-specific coefficients is not reported due to space limitations. It can be seen that allowing for sector-specific markups and bargaining power does not qualitatively change results. The coefficient of the interaction between the Lerner term and total import penetration increases to -0.038, but remains highly significant in the OLS specification. Also the magnitude of the impact of competition from low-wage countries on the Lerner index drops somewhat but keeps its significance in both specifications. The same conclusions

[20] Again, import penetration is defined at the 4-digit NACE level.

Table 6 Impact of import competition, by country of origin, allowing for sector-specific Lerner index and union bargaining power

	(1) OLS	(2) FE	(3) OLS	(4) FE
Imp. pen. intra EU15 × Lerner	0.014 (0.023)	0.018 (0.026)	0.024 (0.023)	0.03 (0.026)
Imp. pen. OECD × Lerner	−0.061 (0.085)	−0.057 (0.100)	−0.037 (0.083)	−0.033 (0.097)
Imp. pen. other × Lerner	−0.181 (0.047)***	−0.163 (0.052)***	−0.202 (0.047)***	−0.185 (0.051)***
Imp. pen. New EU × Lerner	0.099 (0.263)	0.228 (0.290)	-0.095 (0.270)	0.045 (0.295)
Imp. pen. intra EU15 × bargaining	−0.031 (0.024)	−0.029 (0.027)	−0.02 (0.025)	−0.015 (0.027)
Imp. pen. OECD × bargaining	−0.125 (0.104)	−0.131 (0.122)	−0.097 (0.100)	−0.101 (0.116)
Imp. pen. other × bargaining	−0.135 (0.055)**	−0.125 (0.060)**	−0.159 (0.053)***	−0.152 (0.056)***
Imp. pen. new EU × bargaining	0.644 (0.325)**	0.692 (0.366)*	0.439 (0.331)	0.464 (0.370)
Import penetration intra EU	0.020 (0.003)***	0.022 (0.017)	0.019 (0.003)***	0.022 (0.017)
Import penetration OECD	−0.005 (0.010)	−0.087 (0.040)**	−0.003 (0.010)	−0.085 (0.040)**
Import penetration other	−0.005 (0.006)	−0.004 (0.032)	−0.005 (0.006)	0.002 (0.032)
Import penetration new EU	−0.009 (0.026)	−0.070 (0.089)	−0.002 (0.026)	−0.068 (0.088)
Sector dummies interacted with RHS variables	X	X	X	X
Year dummies interacted with RHS variables			X	X
Observations	27,337	27,337	27,337	27,337
Adj. R^2	0.411	0.417	0.413	0.419
No. of firms	5,491	5,491	5,491	5,491

Robust standard errors in parentheses

*, **, *** denote significance at the level of 10, 5, and 1% respectively

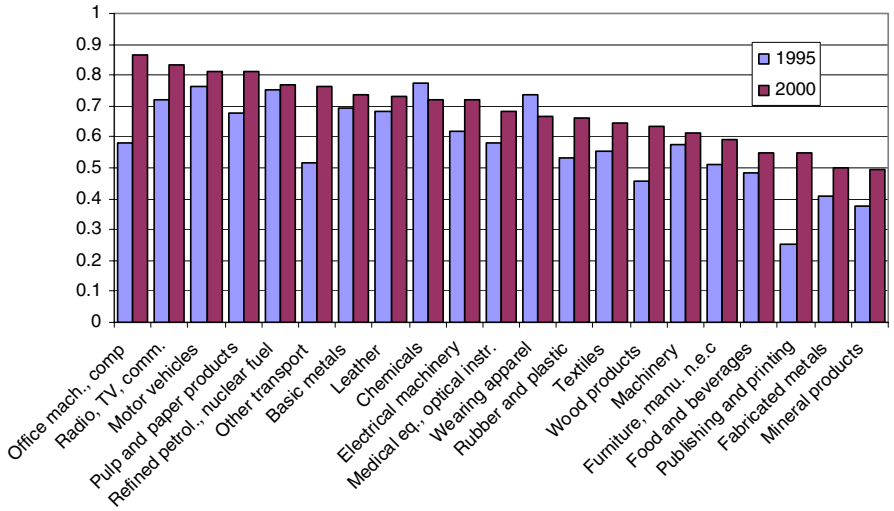

Fig. 4 Outsourcing measure per sector

can be drawn from comparing the impact of import penetration on union bargaining power with and without sector heterogeneity in the parameters.

The last two columns of Tables 5 and 6 present results from OLS and fixed effects regression with both sector and year specific markups and bargaining power. The estimated impact of foreign competition does not differ qualitatively from those reported in Tables 3 and 4 except for the impact of import penetration from EU accession countries on union bargaining power, which drops in magnitude and loses its significance.

4.6 Outsourcing

In recent years, outsourcing of intermediate inputs has developed at a fast pace. In this section we attempt to measure the impact of outsourcing on markups and union bargaining power. We expect intermediate imports to have a positive influence on a firm's markup because imported intermediates lower total costs and thus increase the markup, all else equal (e.g., Amiti and Konings 2007). The impact of outsourcing on union bargaining power is less clear. On the one hand, a high outsourcing degree of a sector can lower the union bargaining power of a firm. This will be true when unions fear that firms will outsource more of their production to low-wage countries if wages are set too high. On the other hand, Kramarz (2003) suggests that bargained wages will increase in a sector which uses intermediate imports since firms which buy their intermediates abroad have to specify the amount of intermediates, their attributes, etc. well in advance to the foreign producer. When the bargaining between union and firm takes place, the intermediates are already ordered. This provides the unions with hold-up opportunities.

Table 7 Impact outsourcing on markup and bargaining power

	(1) OLS1	(2) OLS2	(3) OLS3	(4) FE	(5) OP1	(6) OP2	(7) OP3
Lerner	0.284 (0.023)***	0.247 (0.025)***	0.224 (0.026)***	0.208 (0.029)***	0.255 (0.041)***	0.195 (0.043)***	0.165 (0.045)****
Δk	0.044 (0.004)***	0.045 (0.004)***	0.045 (0.005)***	0.047 (0.006)***			
Bargaining	0.150 (0.025)***	0.124 (0.027)***	0.121 (0.027)***	0.114 (0.029)***	0.139 (0.038)***	0.112 (0.041)***	0.103 (0.043)**
Outsourcing × Lerner	−0.040 (0.038)	0.001 (0.04)	0.074 (0.045)*	0.107 (0.049)**	−0.008 (0.067)	0.057 (0.069)	0.126 (0.078)
Outsourcing × bargaining	−0.031 (0.043)	−0.001 (0.044	0.043 (0.047)	0.059 (0.051)	−0.003 (0.065)	0.026 (0.068)	0.062 (0.074)
(ΔOutsourcing) × Lerner		0.049 (0.011)***	0.041 (0.012)***	0.048 (0.013)***		0.100 (0.021)***	0.091 (0.023)***
(ΔOutsourcing) × bargaining		0.038 (0.012)***	0.026 (0.013)**	0.030 (0.014)**		0.041 (0.016)**	0.034 (0.018)*
Import penetration × Lerner			−0.054 (0.015)***	−0.053 (0.017)***			−0.038 (0.029)
Imp. pen. × bargaining			−0.056 (0.016)***	−0.055 (0.017)***			−0.031 (0.022)
Observations	30,398	30,398	27,337	27,337	16,985	16,985	15,336
Adj. R^2	0.391	0.393	0.393	0.397	0.352	0.354	0.358
No. of firms	6,125	6,125	5,491	5,491	4,704	4,704	4,246

Robust standard errors in parentheses

*, **, *** denote significance at the level of 10, 5, and 1% respectively

Following Feenstra and Hanson (1996) we measure outsourcing as the share of imported intermediate inputs in total intermediate inputs.[21] We observe both variables directly from the Belgian input to output tables for the years 1995 and 2000.[22] For the whole manufacturing sector (NACE 15 to 36) in the year 2000, 69% of all intermediates were imported. In 1995, this percentage was 64%. Figure 4 shows the outsourcing measure for each 2-digit NACE sector (except for the Tobacco industry). Sectors with the most imported intermediates are the Pulp and Paper Products, Motor Vehicles, Office Machinery, and Radio, TV and Communication sectors. Among sectors with the lowest level of outsourcing are Food and Beverages as well as Publishing and Printing, Fabricated Metals and Mineral Products. Most sectors have witnessed an increase in their imported intermediates between 1995 and 2000.

To measure the impact of outsourcing on bargaining, we interact the Lerner and bargaining term with the outsourcing measure. To prevent that outsourcing also captures import penetration, we decided to additionally interact the Lerner index and bargaining term with import penetration. We do not only include the level of outsourcing in the equations but also the growth in outsourcing.[23] The results are reported in Table 7. Columns (1)–(3) represent simple OLS estimates, columns (5)–(7) show the same equations but with Olley–Pakes correction and column (4) shows fixed effects estimates. The results show clearly that the growth in outsourcing is positively correlated with both markups and union bargaining power while the level of outsourcing has no significant effect. Increased outsourcing is likely to have a positive impact on efficiency and productivity as suggested by a number of recent papers (e.g., Girma and Görg 2004). The results in Table 7 confirm this hypothesis. While these results indicate that outsourcing is associated with efficiency gains, this process could still coincide with job destruction as firms are contracting out tasks which could be performed abroad more efficiently. We can also note that bargaining power increases with increased outsourcing, which is consistent with the lock-in story suggested by Kramarz (2003).

5 Conclusions

During the last decade, Europe has witnessed an accelerated process of economic integration. Within the EU, trade barriers were removed and the euro was introduced. The EU has been enlarged with ten new member states and imports from low wage countries have risen dramatically. Economic integration is likely to have an impact on labor and product markets which are both characterized by structural rigidities. Most papers study the impact of economic integration on product and labor markets separately although they are clearly interlinked. Our paper bridges this gap by looking at the link between globalization and product and labor market imperfections simultaneously. To do this, we rely on a rich panel of

[21] Intermediate inputs are defined as inputs coming from industrial sectors (NACE 15 to 36).

[22] These tables are made every 5 years, the most recent was from 2005 and used data from 2000.

[23] Growth = (outsourcing 2000 − outsourcing 1995)/outsourcing 2000.

Belgian manufacturing firms. We use a model that allows us to estimate product market power and union bargaining power simultaneously.

Several results emerge from our estimations. We show that union bargaining power and product market power are positively correlated. Unions are able to negotiate successful deals in sectors with high markups, while they are more reluctant to press for high wage claims in more competitive sectors.

Concerning the impact of globalization, we find sectors with high import penetration rates to have significantly lower markups and union bargaining power. This result is consistent with the imports as market disciplining device and several papers that look at the impact of globalization on union bargaining power. Furthermore, we split up import penetration rates with respect to the country where the imports come from. Especially imports from low wage countries are shown to be concentrated in sectors characterized by low markups and bargaining power. Finally we show that sectors that have been rationalizing their production process by outsourcing part of their production, tend to have higher markups and union bargaining power.

Acknowledgment We would like to thank Italo Colantone, Jan De Loecker, Sabien Dobbelaere, James Hartigan, Jacques Mairesse, Damiaan Persyn, Raf Wouters and researchers of the National Bank of Belgium for helpful comments and suggestions. The research was financed by a grant of the National Bank of Belgium. This paper has benefited from presentations at the National Bank of Belgium, ETSG conference 2006, EARIE conference 2006, LICOS ITD seminar series and the doctoral workshop at Université Catholique de Louvain-la-Neuve.

References

Amiti, M., & Konings, J. (2007). Trade liberalization, intermediate inputs and productivity: Evidence from Indonesia. *American Economic Review, 97*(5), 1611–1638.

Bernard, A., Jensen, J., & Schott, P. (2006). Survival of the best fit: Exposure to low wage countries and the (uneven) growth of US manufacturing plants. *Journal of International Economics, 68*, 219–237.

Binmore, K., Rubinstein, A., & Wolinsky, A. (1986). The Nash bargaining solution in economic modelling. *Rand Journal of Economics, 17*(2), 176–188.

Blanchard, O. (2005). *Macroeconomics*. New Jersey: Pearson Prentice Hall.

Blanchard, O., & Giavazzi, F. (2003). The macroeconomic effects of regulation and deregulation in goods and labor markets. *Quarterly Journal of Economics, 118*(3), 879–909.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic Paneled data models. *Journal of Econometrics, 87*, 115–143.

Booth, A. (1995). *The economics of the trade union*. Cambridge: Cambridge University Press.

Boulhol, H., Dobbelaere, S., & Maioli, S. (2007). Imports as product and labour market discipline. Faculty of Economics and Business Administration working paper 07/479, Ghent: Ghent University.

Braconier, H., & Ekholm, K. (2000). Swedish multinationals and competition from high- and low-wage locations. *Review of International Economics, 8*(3), 448–461.

Brainard, S. L., & Riker, D. A. (1997). Are U.S. multinationals exporting U.S. jobs? NBER working paper no. 5958. Cambridge, MA: National Bureau of Economic Research.

Bughin, J. (1993). Union-firm efficient bargaining and test of oligopolistic conduct. *Review of Economics and Statistics, 75*(3), 563–567.

Bughin, J. (1996). Trade unions and firms' product market power. *The Journal of Industrial Economics, 44*(3), 289–307.

Chen, N., Imbs, J., & Scott, A. (2009). The dynamics of trade and competition. *Journal of International Economics, 77*(1), 50–62.

Clark, A. (1990). Efficient bargains and the McDonald–Solow conjecture. *Journal of Labor Economics, 8*(4), 502–528.

Crépon B., Desplatz, R., & Mairesse, J. (2007). *Price-cost margins and rent sharing: Evidence from a panel of French manufacturing firms*. Paris: CREST, mimeo.

De Loecker, J., & Warzynski, F. (2009) *Markups and firm-level export status*. Princeton, NJ: Princeton University, mimeo.

Directorate-General for Economic and Financial Affairs. (2005). The EU Economy: 2005 Review. *European Economy, 6/2005*.

Dobbelaere, S. (2004). Estimation of price-cost margins and union bargaining power for Belgian manufacturing. *International Journal of Industrial Organization, 22*(10), 1381–1398.

Dobbelaere, S., & Mairesse, J. (2008). Panel data estimates of the production function and product and labor market imperfections. NBER working paper 13975. Cambridge, MA: National Bureau of Economic Research.

Dumont, M., Rayp, G., & Willemé, P. (2006). Does internationalization affect union bargaining power? An empirical study for five EU countries. *Oxford Economic Papers, 58*, 77–102.

Feenstra, R., & Hanson, G. (1996). Globalization, outsourcing and wage inequality. *American Economic Review, 86*(2), 40–45.

Girma, S., & Görg, H. (2004). Outsourcing, foreign ownership and productivity: Evidence from UK establishment level data. *Review of International Economics, 12*(5), 817–832.

Hall, R. E. (1988). The relation between price and marginal cost in U.S. industry. *Journal of Political Economy, 96*(5), 921–947.

Hanson, G., Mataloni, R., Jr., & Slaughter, M. (2005). Vertical production networks in multinational firms. *Review of Economics and Statistics, 87*(4), 664–678.

Harrison, A. E. (1994). Productivity, imperfect competition and trade reform. Theory and evidence. *Journal of International Economics, 36*, 53–73.

Hoekman, B., & Kee, H. L. (2007). Imports, entry and competition law as market disciplines. *European Economic Review, 51*, 831–858.

Konings, J., & Murphy, A. (2006). Do multinational enterprises substitute parent jobs for foreign ones? Evidence from European firm level panel data. *Review of World Economics/Weltwirtschaftliches Archiv, 142*(1), 1–20.

Konings, J., Van Cayseele, P., & Warzynski, F. (2001). The dynamics of industrial mark-ups in two small open economies: Does national competition policy matter? *International Journal of Industrial Organization, 19*, 841–859.

Konings, J., Van Cayseele, P., & Warzynski, F. (2005). The effects of privatization and competitive pressure on firms' price-cost margins: Micro evidence from emerging economies. *Review of Economics and Statistics, 87*(1), 124–134.

Konings, J., & Walsh, P. (1994). Evidence of efficiency wage payments in UK firm level panel-data. *Economic Journal, 104*(424), 542–555.

Kramarz, F. (2003). Wages and international trade. CEPR discussion paper No. 3963. London: Centre for Economic Policy Research.

Krugman, P. (1979). Increasing returns, monopolistic competition and international trade. *Journal of International Economics, 9*(4), 469–479.

Levinsohn, J. (1993). Testing the imports-as-market-discipline hypothesis. *Journal of International Economics, 35*, 1–22.

Melitz, M. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71*(6), 1695–1725.

Olley, S., & Pakes, A. (1996). The dynamics of productivity in the telecommunication equipment industry. *Econometrica, 64*(5), 1263–1297.

Rodrik, D. (1997). *Has globalization gone too far*. Washington, DC: Institute for International Economics.

Stewart, M. (1990). Union wage differentials, product market influences and the division of rents. *The Economic Journal, 100*, 1122–1137.

Van Beveren, I. (2007). Footloose multinationals in Belgium? *Review of World Economics/Weltwirtschaftliches Archiv, 143*(3), 483–507.